
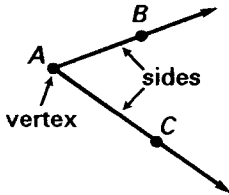
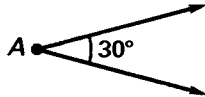
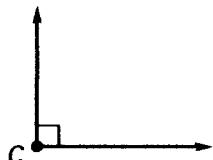
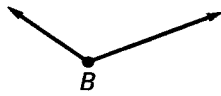
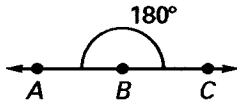


Drawing and Measuring Angles**GOAL****Draw, measure, and identify angles.**

Accurate measurement of angles can lead to solving real-life problems such as the height of a mountain.

Terms to Know**Example/Illustration**

Ray part of a line that consists of a point, called an <i>initial point</i> , and all points on the line that extend in one direction	 <p>initial point A</p>
Angle consists of two different rays that have the same initial point. The rays are the <i>sides</i> of the angle, and the initial point is the <i>vertex</i> of the angle	 <p>This angle has sides \overrightarrow{AB} and \overrightarrow{AC}, and it is denoted by $\angle BAC$, $\angle CAB$, or $\angle A$.</p>
Acute Angle angle with measure between 0° and 90°	 <p>$\angle A$ measures less than 90° and is called acute.</p>
Right Angle angle with measure equal to 90°	 <p>$\angle C$ measures 90° and is called a right angle.</p>
Obtuse Angle angle with measure between 90° and 180°	 <p>$\angle B$ measures more than 90° and is called obtuse.</p>
Straight Angle angle with measure equal to 180°	 <p>$\angle CBA$ measures 180° and is called a straight angle.</p>

Understanding the Main Ideas

The ancient Babylonians used a base 60 number system. They divide a full circle into 360 degrees. One degree is $\frac{1}{360}$ of the way around the circle. We continue to use degree measurement today.

The measurement of $\angle A$ is denoted by $m\angle A$. Angles can be measured by using a protractor by placing a vertex of the angle at the center of the base and one ray along the base. Extend the other ray until you can read the measurement. Most protractors read both right to left and left to right. Read from the ray along the base to the other ray starting with 0° .

A protractor can also be used to draw an angle. Draw a ray from the center point (vertex) along the edge to the right or left. Then mark the degree measurement desired using the bottom numbers if the first ray points to the right and the top numbers if the first ray points to the left. Draw a ray from the vertex to the mark.

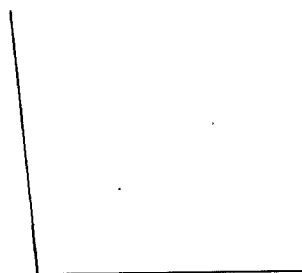
Angles and Their Measures

Find the measure of each angle to the nearest degree.

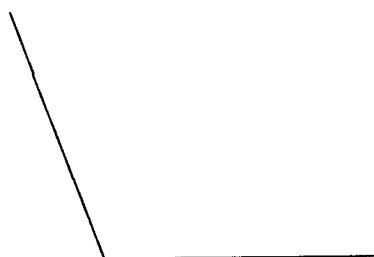
1)



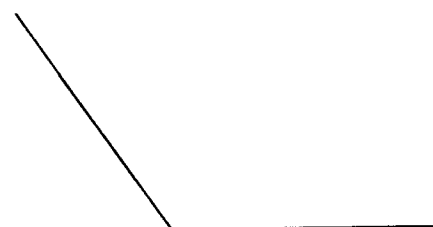
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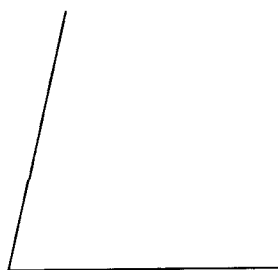
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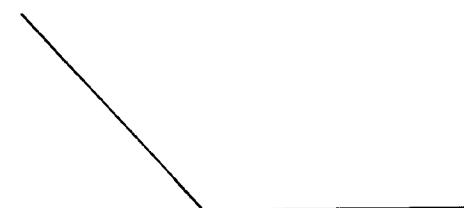
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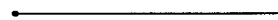


Draw an angle with the given measurement.

11) 90°



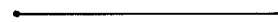
12) 70°



13) 120°



14) 105°



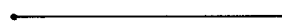
15) 31°



16) 166°



17) 144°



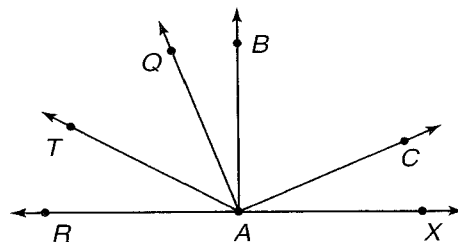
18) 53°



Skills Practice*1.4 Blue Book***Angle Measure**

*Use a protractor to find the measure of each angle.
Then classify each angle as acute, obtuse, or right.*

- | | |
|------------------|------------------|
| 1. $\angle TAR$ | 2. $\angle BAX$ |
| 3. $\angle CAX$ | 4. $\angle TAX$ |
| 5. $\angle BAR$ | 6. $\angle QAB$ |
| 7. $\angle RAC$ | 8. $\angle TAC$ |
| 9. $\angle QAC$ | 10. $\angle QAR$ |
| 11. $\angle QAX$ | 12. $\angle TAB$ |



*Use a protractor to draw an angle having each measurement.
Then classify each angle as acute, obtuse, or right.*

- | | | |
|----------------|-----------------|-----------------|
| 13. 50° | 14. 120° | 15. 90° |
| 16. 25° | 17. 100° | 18. 140° |
| 19. 10° | 20. 135° | 21. 85° |

1.4

Angles and Their Measures

22

- Goals**
- Use angle postulates.
 - Classify angles as acute, right, obtuse, or straight.

VOCABULARY

Angle

Sides of an angle

Vertex of an angle

Congruent angles

Measure of an angle

Interior of an angle

Exterior of an angle

Acute angle

Right angle

Obtuse angle

Straight angle

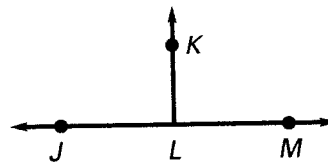
Adjacent angles

Example 1 Naming Angles

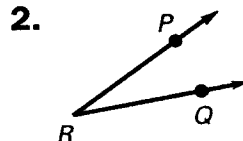
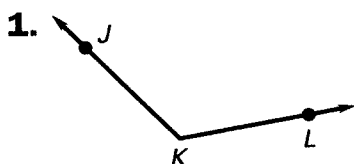
Name the angles in the figure.

There are three different angles.

- _____ or _____
- _____ or _____
- _____ or _____



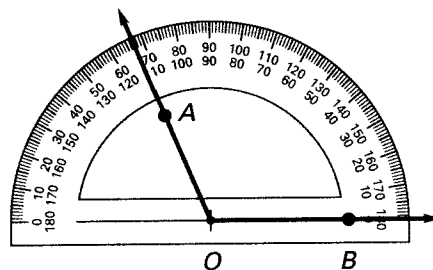
✓ **Checkpoint** Write two names for the angle.

**POSTULATE 3: PROTRACTOR POSTULATE**

Consider a point A on one side of \overleftrightarrow{OB} . The rays of the form \overrightarrow{OA} can be matched one to one with the real numbers from 0 to _____.

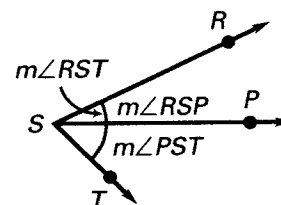
The measure of _____ is equal to _____

_____ between the real numbers for \overrightarrow{OA} and \overrightarrow{OB} .

**POSTULATE 4: ANGLE ADDITION POSTULATE**

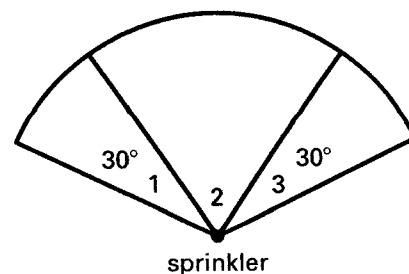
If P is in the interior of $\angle RST$, then

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}.$$



Example 2 Calculating Angle Measures

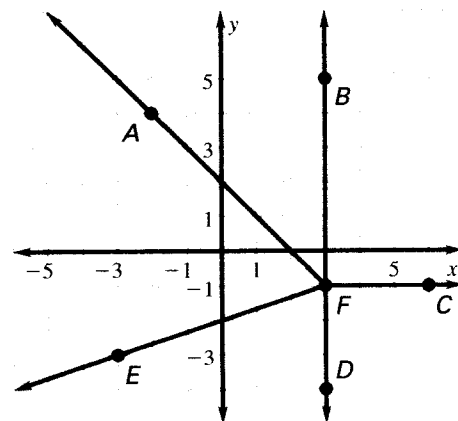
Lawn Care A lawn is watered by a sprinkler that has two fixed spray heads that each spray water in a fan shape. The angle that determines each of the fan shapes is 120° . The shaded area in the diagram shows where the two fan shapes overlap. Find the measure of $\angle 2$.



Example 3 Classifying Angles in a Coordinate Plane

Measure the angle. Then classify the angle as acute, right, obtuse, or straight.

- $\angle AFD$
- $\angle AFE$
- $\angle BFD$
- $\angle BFC$



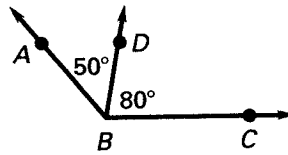
Solution

Use a protractor to measure each angle.

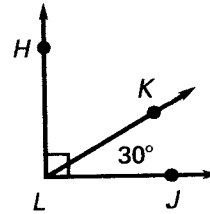
Measure	Classification
a. $m\angle AFD =$ _____	_____
b. $m\angle AFE =$ _____	_____
c. $m\angle BFD =$ _____	_____
d. $m\angle BFC =$ _____	_____

✓ **Checkpoint** Use the Angle Addition Postulate to find the measure of the angle.

3. $m\angle ABC$



4. $m\angle HLK$



State whether the angle appears to be *acute*, *right*, *obtuse*, or *straight*. Then estimate its measure.

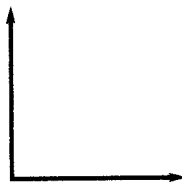
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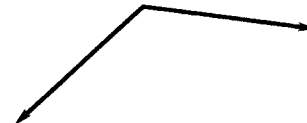
6.



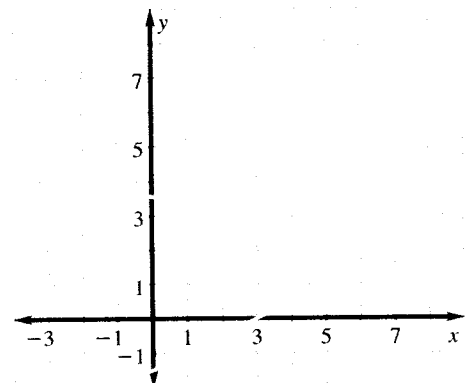
7.



8.



9. Plot the points $P(-2, 4)$, $Q(5, 7)$, $R(7, 2)$, and $S(1, -1)$. Then measure and classify $\angle PRS$.

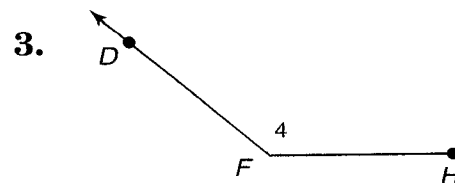
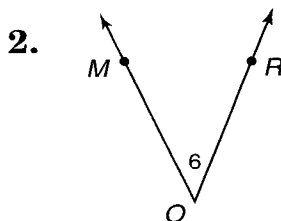
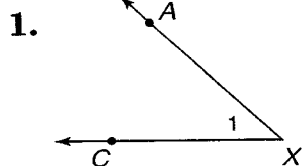


Skills Practice

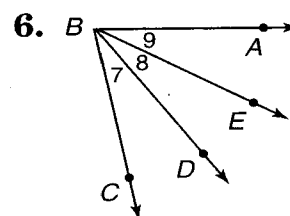
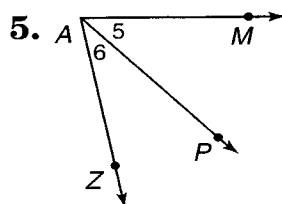
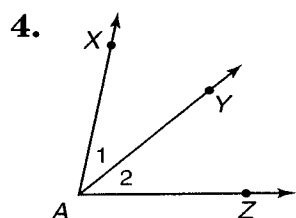
1.4 Blue Book

Angles

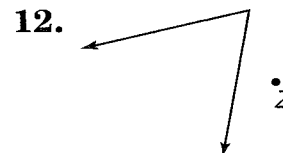
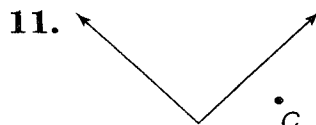
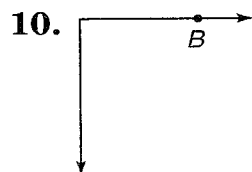
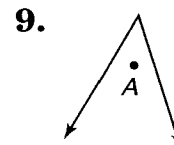
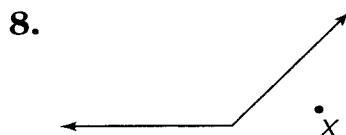
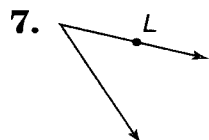
Name each angle in four ways. Then identify its vertex and its sides.



Name all angles having A as their vertex.



Tell whether each point is in the interior, exterior or on the angle.



Determine whether each statement is true or false.

13. The figure formed by opposite rays is sometimes referred to as a straight angle.

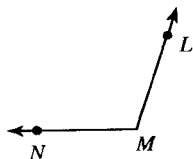
14. The vertex is in the exterior of an angle.

15. An angle separates the plane into two parts: the interior and the exterior of the angle.

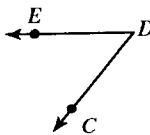
Naming Angles

Name the vertex and sides of each angle.

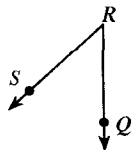
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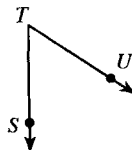
2)



3)

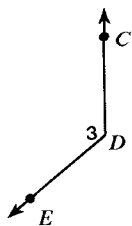


4)

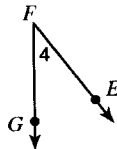


Name each angle in four ways.

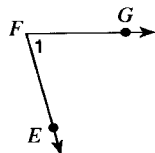
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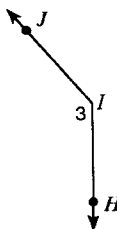
6)



7)



8)

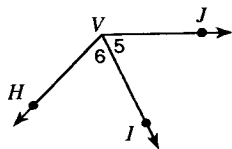


Draw and label an angle to fit each description.

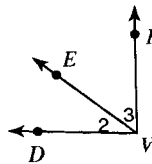
9) an obtuse angle, $\angle Y$ 10) an acute angle, $\angle JIH$ 11) a right angle, $\angle 3$ 12) a straight angle, $\angle CDE$

Name all the angles that have V as a vertex.

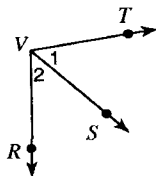
13)



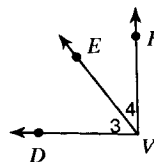
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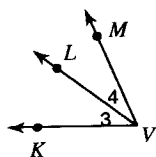
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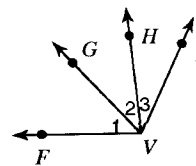
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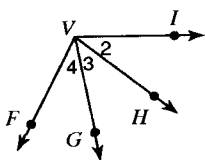
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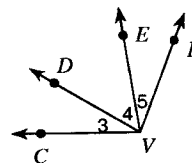
18)



19)

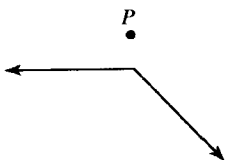


20)

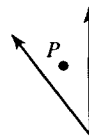


State if the given point is interior, exterior, or on the angle.

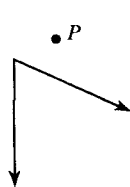
21)



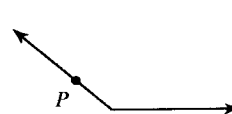
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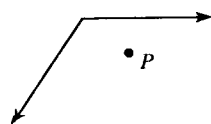
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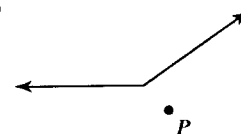
24)



25)



26)



Critical thinking questions:

27) Draw a diagram with an acute angle ABC and an obtuse angle DBE so that point D is in the interior of angle ABC .

28) In question #29, why is it impossible for both point D and point E to be in the interior of angle ABC ?

Classifying Angles

Classify each angle as acute, obtuse, right, or straight.

1)



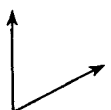
2)



3)



4)



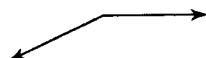
5)



6)



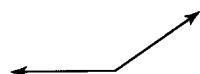
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8)



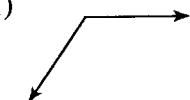
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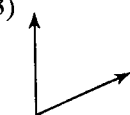
11)



12)



13)



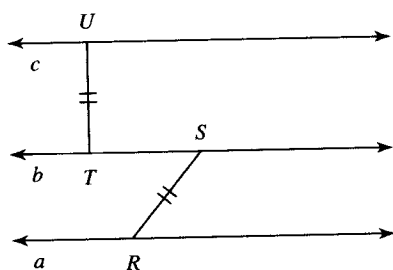
14)

15) 16° 17) 90° 19) 59° 21) 119° 23) 162° 25) 15° 27) 96° 16) 180° 18) 97° 20) 39° 22) 82° 24) 52° 26) 116° 28) 74°

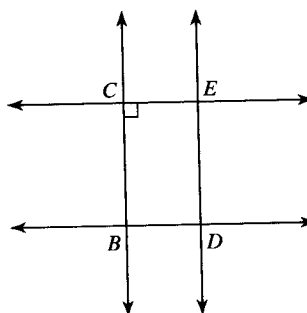
Information in Geometric Diagrams

List all information given by the marks on the diagram.

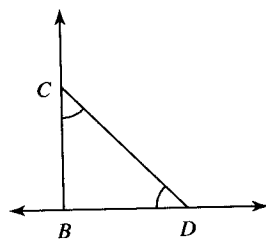
1)



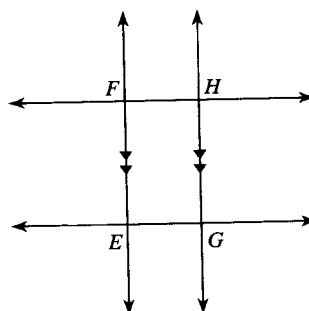
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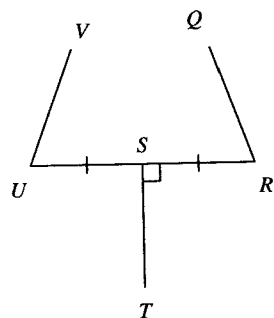
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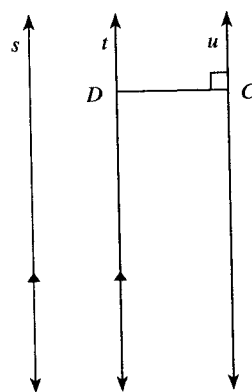
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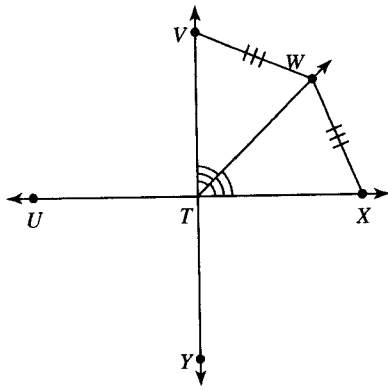
5)



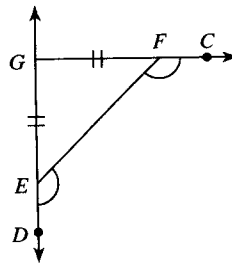
6)



7)

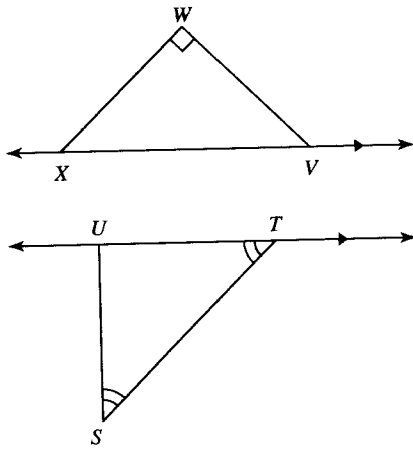


8)

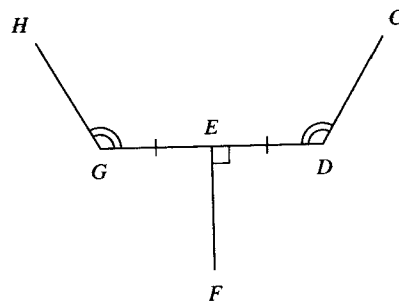


List all information given by the marks on the diagram.

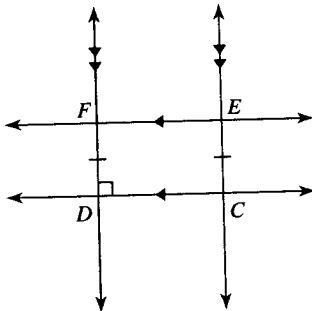
15)



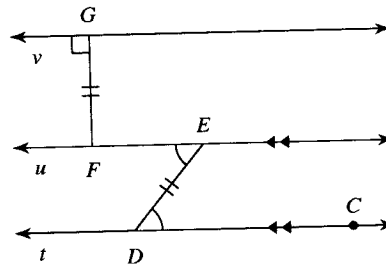
16)



17)



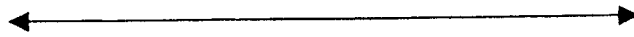
18)



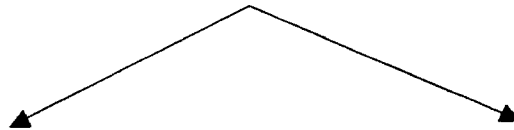
Angle Bisectors

Bisect:

1. Bisect the line



2. Bisect the angle

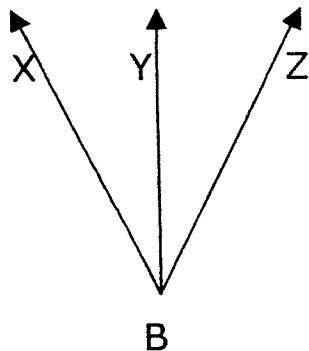


Angle Bisector: ray, segment, or line which divides an angle into _____

A straight angle when bisected creates _____



Ex 1)

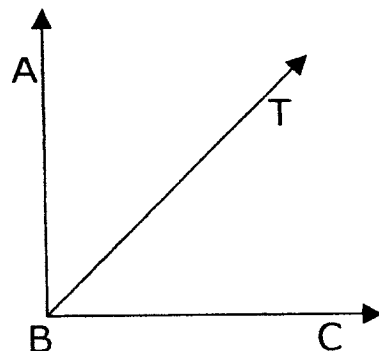


Given: BY bisects $\angle XBZ$

Find: $\angle XBY =$

$\angle YBZ =$

Ex 2)



Given: BT bisects $\angle ABC$

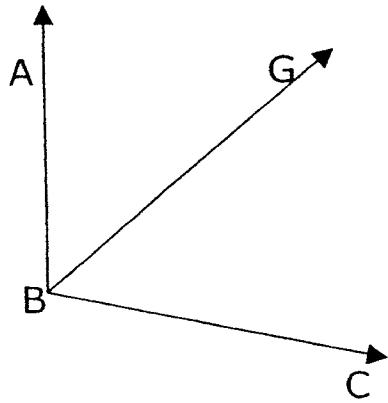
Find: $\angle TBC$

$\angle ABC$

$\angle ABC$ is also known as a _____ angle.

Basic Geometry

Ex 3)



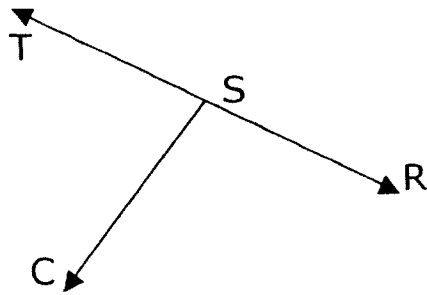
Given: BG bisects $\angle ABC$

$$\angle ABC = 140^\circ$$

Find: $\angle ABG$

$$\angle GBC$$

Ex 4)



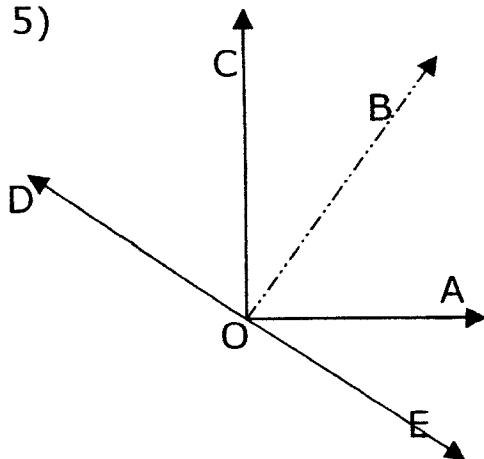
Given: SC bisects $\angle TSR$

$$\angle TSR = 180^\circ$$

Find: $\angle TSC =$

$$\angle CSR =$$

Ex 5)



Given: OB bisects $\angle COA$

$$\angle COE = 130^\circ$$

$$\angle AOE = 30^\circ$$

Find: $\angle COB =$

$$\angle BOA =$$

$$\angle COD =$$

VOCAB: Angle Bisector:

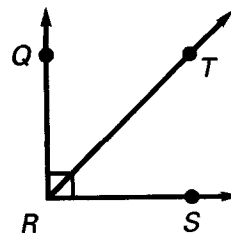
28

Example 3 Dividing an Angle Measure in Half

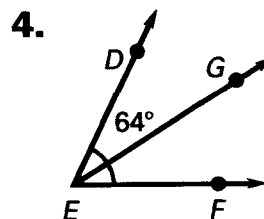
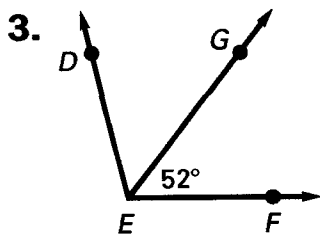
\overrightarrow{RT} is the angle bisector of $\angle QRS$. Given that $m\angle QRS = 90^\circ$, what are the measures of $\angle QRT$ and $\angle TRS$?

An angle bisector divides an angle into _____, each of which has half the measure of the original angle. So,

$$m\angle QRT = m\angle \underline{\hspace{1cm}} = \underline{\hspace{1cm}} = \underline{\hspace{1cm}}.$$



✓ **Checkpoint** \overrightarrow{EG} is the angle bisector of $\angle DEF$. Find the two angle measures not given in the diagram.



UNIT WORK SHEET

Section 1

Angle Measurement Worksheet

Directions: Measure each angle as indicated by the arrows and record your measurement in the space provided. Designate each angle as acute (A), right (R) or obtuse (O) or none of these (N).

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

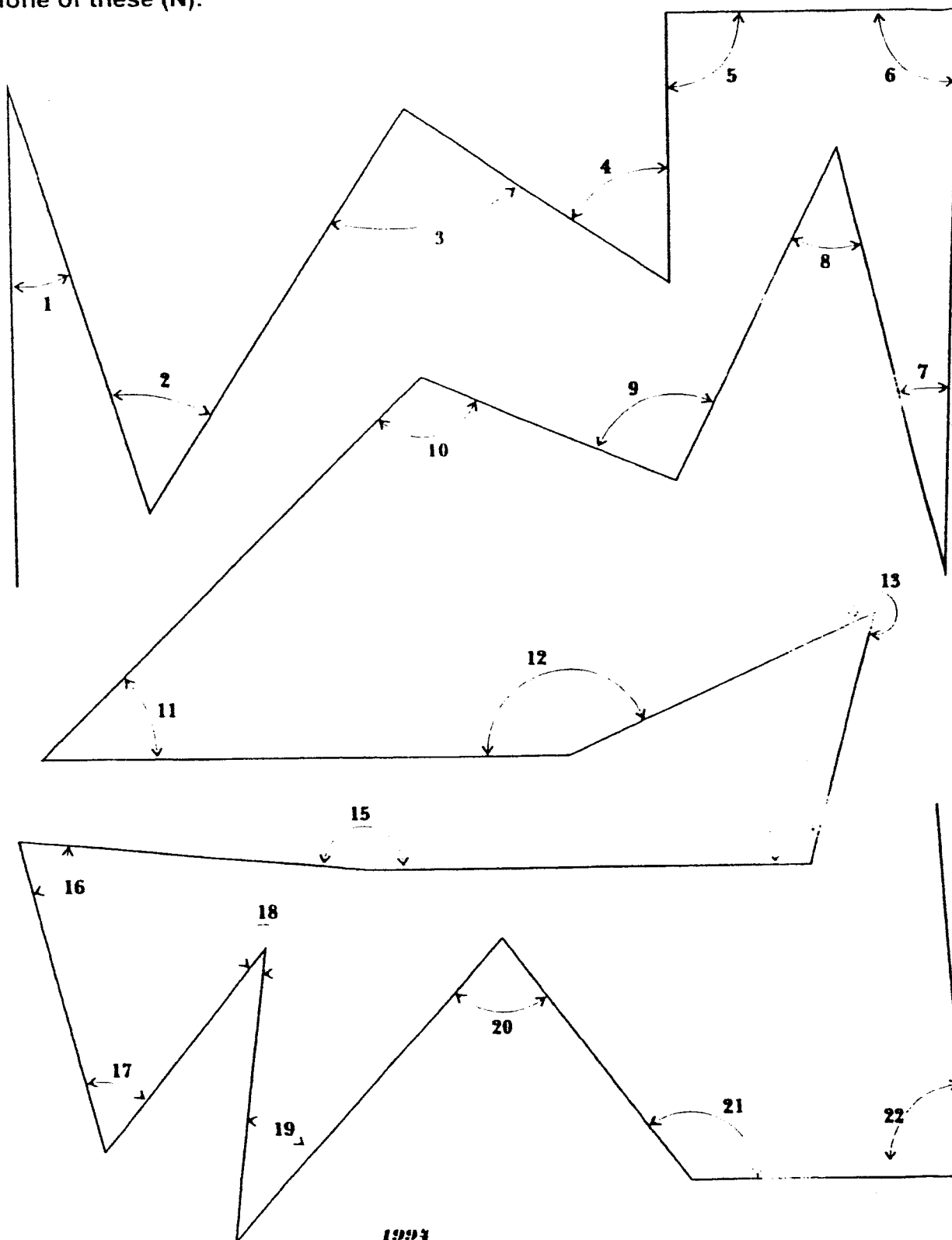
18. _____

19. _____

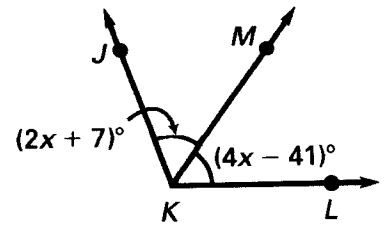
20. _____

21. _____

22. _____

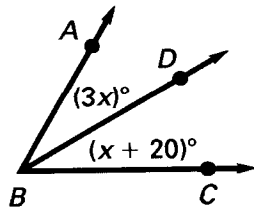


In the diagram, \overrightarrow{KM} bisects $\angle JKL$.
The measures of the two congruent angles are $(2x + 7)^\circ$ and $(4x - 41)^\circ$.
Find the measures of $\angle JKM$ and $\angle MKL$.

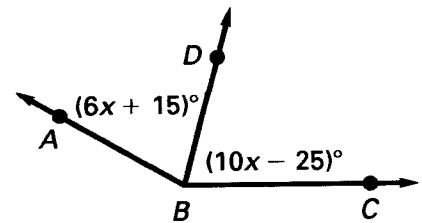


✓ **Checkpoint** \overrightarrow{BD} is the angle bisector of $\angle ABC$. Find $m\angle ABD$ and $m\angle DBC$.

5.




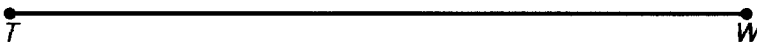
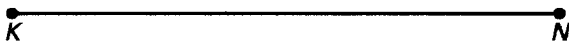
6.



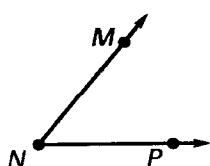
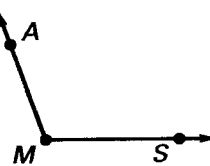
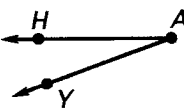
Practice A

For use with pages 34-42

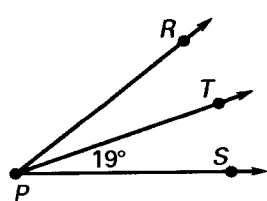
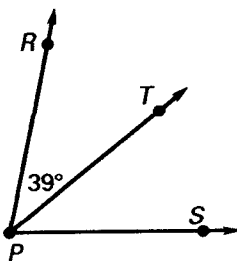
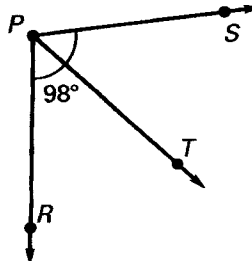
Use a ruler to measure and redraw the line segment on a piece of paper. Then use construction tools to find the segment bisector.

1. 
2. 
3. 

Use a protractor to measure and redraw the angle on a piece of paper. Then use construction tools to find the angle bisector.

11. 
12. 
13. 

\overrightarrow{PT} is the angle bisector of $\angle RPS$. Find the two angle measures not given in the diagram.

14. 
15. 
16. 

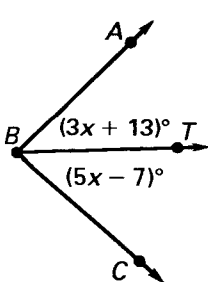
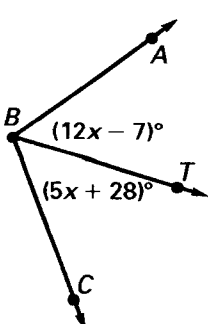
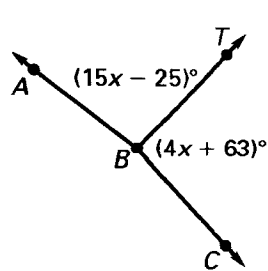
Practice B

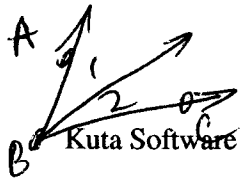
For use with pages 34-42

* Bisect means

$$m\angle ABT = m\angle TBC$$

\overrightarrow{BT} bisects $\angle ABC$. Find the value of x .

15. 
16. 
17. 



$$m\angle 1 + m\angle 2 = m\angle ABC$$

30

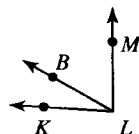
Kuta Software - Infinite Geometry

Name _____

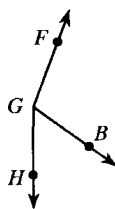
The Angle Addition Postulate

Date _____ Period _____

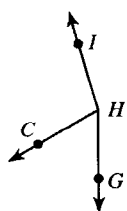
- 1) Find $m\angle KLM$ if $m\angle KLB = 26^\circ$
and $m\angle BLM = 60^\circ$.



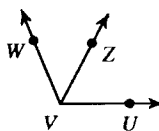
- 2) Find $m\angle FGH$ if $m\angle FGB = 105^\circ$
and $m\angle BGH = 54^\circ$.



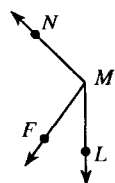
- 3) $m\angle GHC = 60^\circ$ and $m\angle CHI = 104^\circ$.
Find $m\angle GHI$.



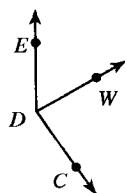
- 4) Find $m\angle WVU$ if $m\angle ZVU = 62^\circ$
and $m\angle WVZ = 50^\circ$.



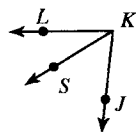
- 5) $m\angle FMN = 99^\circ$ and $m\angle LMF = 36^\circ$.
Find $m\angle LMN$.



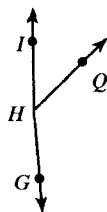
- 6) Find $m\angle WDC$ if $m\angle EDC = 145^\circ$
and $m\angle EDW = 61^\circ$.



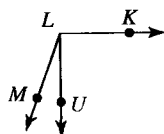
- 7) Find $m\angle JKL$ if $m\angle SKL = 31^\circ$
and $m\angle JKS = 52^\circ$.



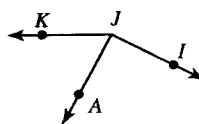
- 8) Find $m\angle IHQ$ if $m\angle IHG = 176^\circ$
and $m\angle QHG = 130^\circ$.



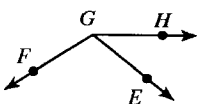
- 9) Find $m\angle KLU$ if $m\angle ULM = 20^\circ$
and $m\angle KLM = 110^\circ$.



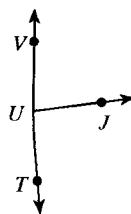
- 10) Find $m\angle IJA$ if $m\angle AJK = 61^\circ$
and $m\angle IJK = 153^\circ$.



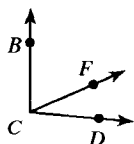
- 11) $m\angle HGF = 16x + 4$, $m\angle EGF = 110^\circ$,
and $m\angle HGE = 3x + 11$. Find x .



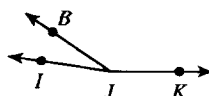
- 12) $m\angle VUT = 175^\circ$, $m\angle VUJ = 17x - 3$,
and $m\angle JUT = 17x + 8$. Find x .



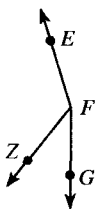
- 13) $m\angle FCD = x + 41$, $m\angle BCF = x + 78$,
and $m\angle BCD = 95^\circ$. Find x .



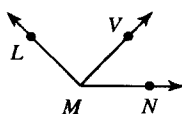
- 14) Find x if $m\angle BJK = 146 + 2x$,
 $m\angle IJK = 172^\circ$, and $m\angle IJB = 2x + 26$.



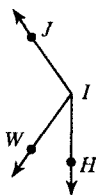
- 15) $m\angle GFZ = 38^\circ$, $m\angle ZFE = 2x + 125$,
and $m\angle GFE = x + 163$. Find x .



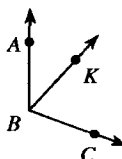
- 16) Find x if $m\angle LMN = 135^\circ$,
 $m\angle LMV = -1 + 45x$, and $m\angle VMN = 23x$.



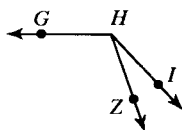
- 17) Find $m\angle HIW$ if $m\angle WIJ = 10x$,
 $m\angle HIJ = 145^\circ$, and $m\angle HIW = 2x + 13$.



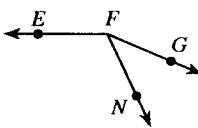
- 18) $m\angle ABC = 17x + 8$, $m\angle ABK = 42^\circ$,
and $m\angle KBC = 12x - 4$. Find $m\angle ABC$.



- 19) $m\angle ZHG = 11x - 1$, $m\angle IHZ = 24^\circ$,
and $m\angle IHG = 12x + 13$. Find $m\angle IHG$.



- 20) $m\angle GFN = 4x + 10$, $m\angle NFE = 14x + 3$,
and $m\angle GFE = 157^\circ$. Find $m\angle NFE$.



1.6

Angle Pair Relationships

#31

- Goals**
- Identify vertical angles and linear pairs.
 - Identify complementary and supplementary angles.

VOCABULARY

Vertical angles

Linear pair

Complementary angles

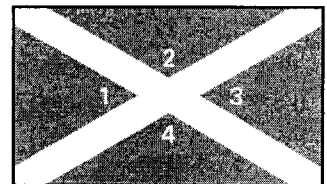
Complement

Supplementary angles

Supplement

Example 1 *Finding Angle Measures*

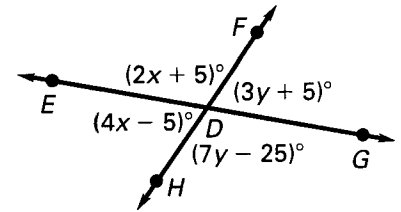
In the flag shown at the right, $\angle 1$ has a measure of 60° . Find $m\angle 2$ and $m\angle 3$.



Example 2 *Finding Angle Measures*

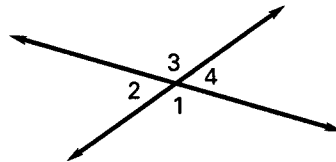
Solve for x and y . Then find the angle measures.

Use the fact that the sum of the measures of angles that form a linear pair is _____.

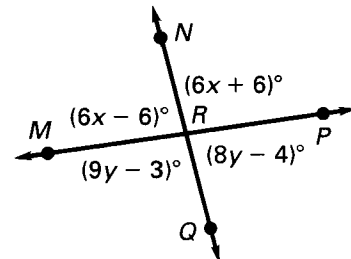


✓ Checkpoint Complete the following exercises.

1. The measure of $\angle 2$ is 52° . Find the measures of $\angle 1$, $\angle 3$, and $\angle 4$.



2. Solve for x and y . Then find the angle measures.



Example 4 *Finding Measures of Complements and Supplements*

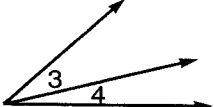
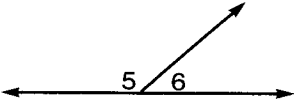
- a. Given that $\angle S$ is a complement of $\angle T$ and $m\angle S = 32^\circ$, find $m\angle T$.
b. Given that $\angle U$ is a supplement of $\angle V$ and $m\angle U = 27^\circ$, find $m\angle V$.

5. $\angle M$ is a complement of $\angle N$
and $m\angle M = 63^\circ$. Find $m\angle N$.

6. $\angle C$ is a supplement of $\angle D$
and $m\angle C = 109^\circ$. Find
 $m\angle D$.

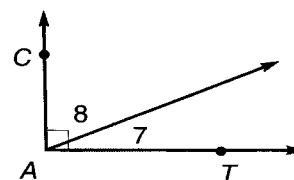
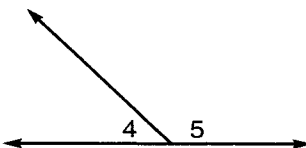
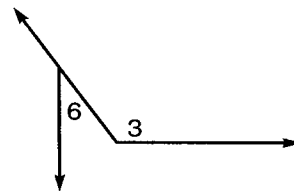
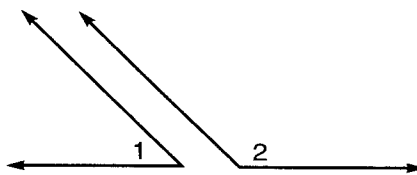
Study Guide

Adjacent Angles and Linear Pairs of Angles

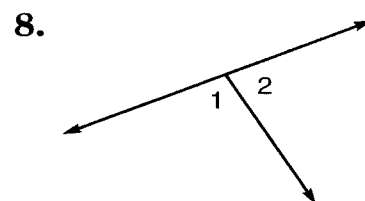
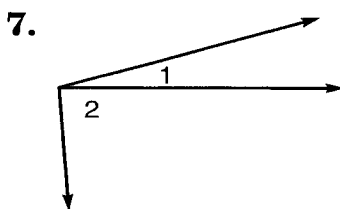
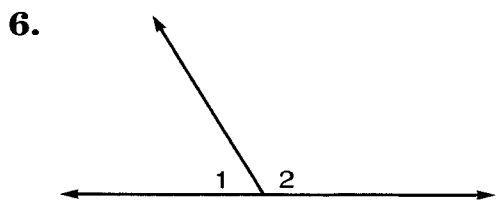
Pairs of Angles		
Special Name	Definition	Examples
adjacent angles	angles in the same plane that have a common vertex and a common side, but no common interior points	 $\angle 3$ and $\angle 4$ are adjacent angles.
linear pair	adjacent angles whose noncommon sides are opposite rays	 $\angle 5$ and $\angle 6$ form a linear pair.

$m\angle 1 = 45$, $m\angle 2 = 135$, $m\angle 3 = 125$, $m\angle 4 = 45$, $m\angle 5 = 135$, $m\angle 6 = 35$, and $\angle CAT$ is a right angle. Determine whether each statement is true or false.

- $\angle 1$ and $\angle 2$ form a linear pair.
- $\angle 4$ and $\angle 5$ form a linear pair.
- $\angle 6$ and $\angle 3$ are adjacent angles.
- $\angle 7$ and $\angle 8$ are adjacent angles.
- $\angle CAT$ and $\angle 7$ are adjacent angles.

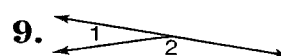
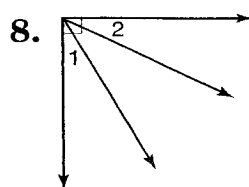
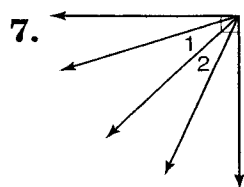
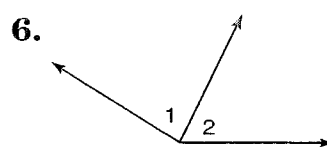
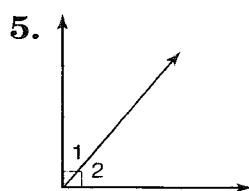
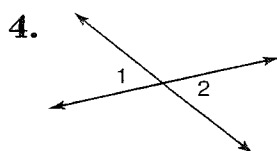
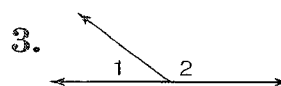
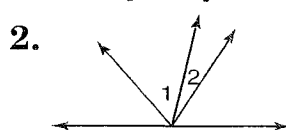
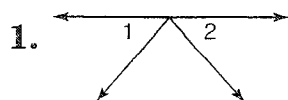


Use the terms adjacent angles, linear pair, or neither to describe angles 1 and 2 in as many ways as possible.



Adjacent Angles and Linear Pairs of Angles

Use the terms adjacent angles, linear pair, or neither to describe angles 1 and 2 in as many ways as possible.



In the figure at the right, \overrightarrow{MA} and \overrightarrow{MG} are opposite rays. Also, \overrightarrow{MC} and \overrightarrow{MJ} are opposite rays.

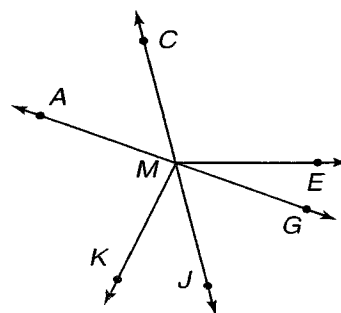
10. Which angle forms a linear pair with $\angle AMC$?

11. Do $\angle CME$ and $\angle EMJ$ form a linear pair?
Justify your answer.

12. Name two angles that are adjacent to $\angle EMG$.



13. Name two angles that form a linear pair with $\angle JMG$.

14. Name three angles that are adjacent to $\angle AMK$.



Study Guide**Complementary and Supplementary Angles**

The table identifies several different types of angles that occur in pairs.

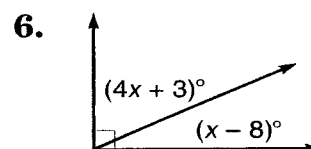
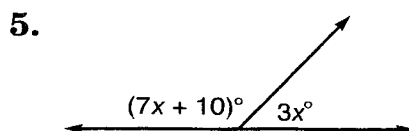
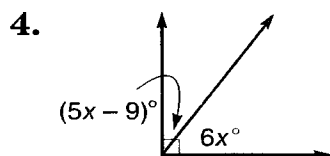
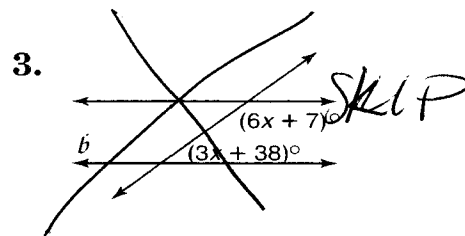
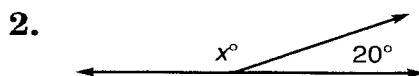
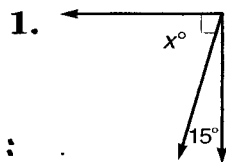
Pairs of Angles		
Special Name	Definition	Examples
complementary angles	two angles whose measures have a sum of 90	
supplementary angles	two angles whose measures have a sum of 180	

$$\text{Rt } \angle\text{'s} : m\angle 1 + m\angle 2 = 90^\circ$$

Straight line

$$m\angle 1 + m\angle 2 = 180^\circ$$

Each pair of angles is either complementary or supplementary. Find the value of x in each figure.



7. If $m\angle P = 28$, $\angle R$ and $\angle P$ are supplementary, $\angle T$ and $\angle P$ are complementary, and $\angle Z$ and $\angle T$ are complementary, find $m\angle R$, $m\angle T$, and $m\angle Z$.

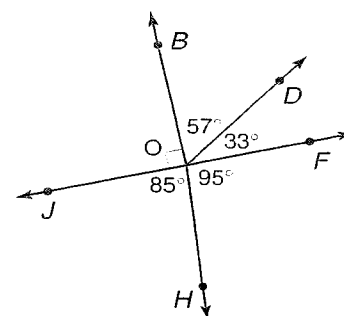
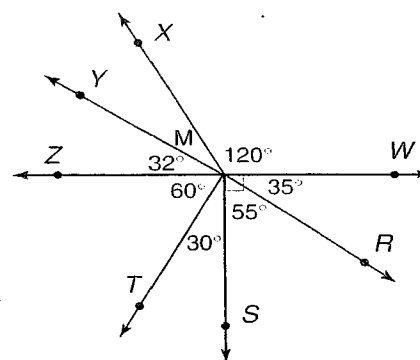
8. If $\angle S$ and $\angle G$ are supplementary, $m\angle S = 6x + 10$, and $m\angle G = 15x + 23$, find x and the measure of each angle.

Skills Practice

#34

Complementary and Supplementary Angles*Refer to the figures at the right.*

1. Name a pair of complementary angles.
2. Name two right angles.
3. Name three pairs of adjacent supplementary angles.
4. Find the measure of an angle that is complementary to $\angle JOH$.
5. Find the measure of an angle that is supplementary to $\angle DOF$.
6. Find the measure of $\angle BOH$.
7. Name a pair of complementary angles.
8. Name two right angles.
9. Find the measure of an angle that is complementary to $\angle YMZ$.
10. Find the measure of an angle that is supplementary to $\angle WMT$.
11. Find the measure of $\angle XMY$.
12. Is $\angle YMT$ a right angle? Justify your answer.
13. Find the measure of an angle that is supplementary to $\angle XMR$.

**Exercises 1-6****Exercises 7-13**

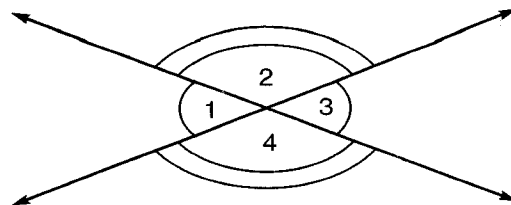
14. Find $m\angle 3$ if $\angle 3$ and $\angle 4$ form a linear pair and $m\angle 4 = 55$.
15. If $\angle 1$ and $\angle 2$ form a linear pair and $m\angle 1 = 130$, find $m\angle 2$.
16. Angles DEF and XYZ form a linear pair. If $m\angle DEF = 170$, what is $m\angle XYZ$?
17. If $\angle 4$ and $\angle 8$ are complementary and $m\angle 4 = 45$, find $m\angle 8$.
18. If $m\angle 3 = 10$ and $\angle 3$ and $\angle 7$ are complementary, what is $m\angle 7$?

Study Guide

If angles are congruent then
 $m\angle A = m\angle B$

Congruent Angles

Opposite angles formed by intersecting lines are called **vertical angles**. Vertical angles are always congruent. $\angle 1$ and $\angle 3$, and $\angle 2$ and $\angle 4$ are pairs of vertical angles.



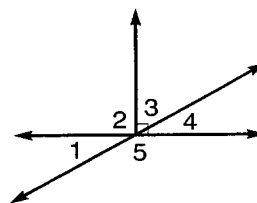
Identify each pair of angles in Exercises 1-4 as adjacent, vertical, complementary, supplementary, and/or as a linear pair.

1. $\angle 1$ and $\angle 2$

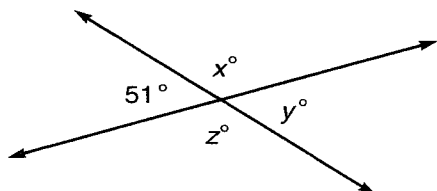
2. $\angle 1$ and $\angle 4$

3. $\angle 3$ and $\angle 4$

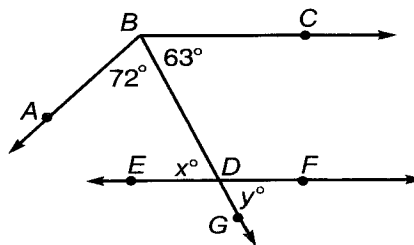
4. $\angle 1$ and $\angle 5$



5. Find x , y , and z .



6. Find x and y if $\angle CBD \cong \angle FDG$.



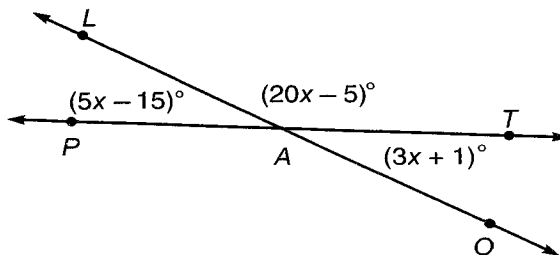
Use the figure shown to find each of the following.

7. x

8. $m\angle LAT$

9. $m\angle TAO$

10. $m\angle PAO$

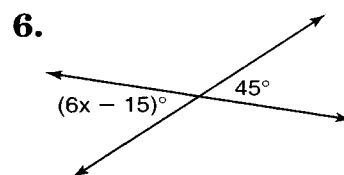
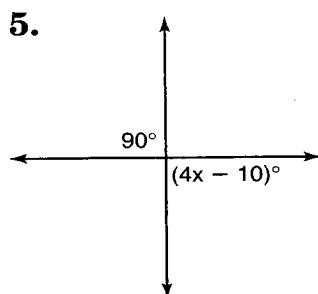
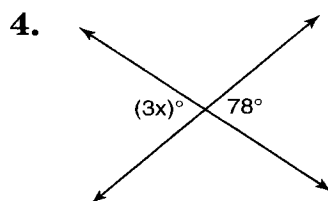
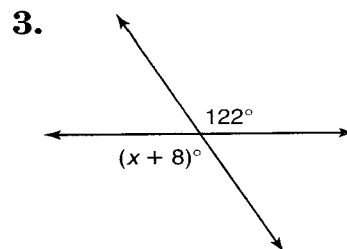
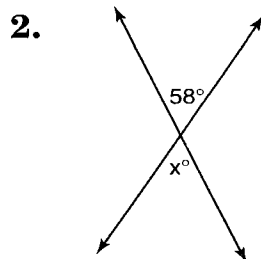
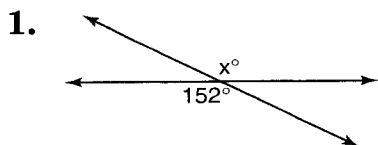


Skills Practice

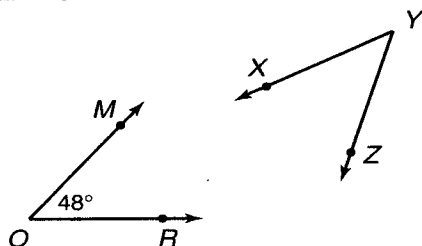
#35

Congruent Angles

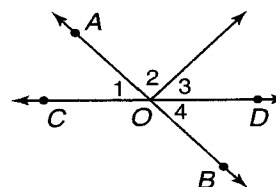
Find the value of x in each figure.



7. What is the measure of an angle complementary to $\angle XYZ$ if $\angle MOR \cong \angle XYZ$?

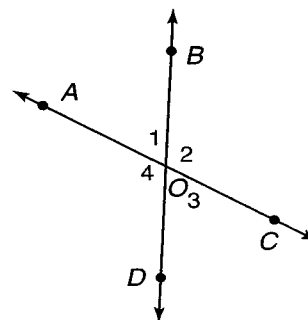


8. \overrightarrow{OA} and \overrightarrow{OB} are opposite rays and \overrightarrow{OC} and \overrightarrow{OD} are also opposite rays. If $m\angle 2 = 90$ and $m\angle 1$ and $= 45$, what is $m\angle 4$?



Use the figure at the right.

9. If $\angle 1 \cong \angle 3$ and $m\angle 1 = 64$, find the measure of an angle that is supplementary to $\angle 3$.
10. If $\angle AOB$ is supplementary to $\angle BOC$, $\angle BOC$ is supplementary to $\angle COD$, and $m\angle AOB = 58$, find $m\angle BOC$ and $m\angle COD$.
11. Find the measure of an angle that is complementary to $\angle 1$ if $\angle 1 \cong \angle 2$ and $m\angle 2 = 75$.
12. Find the measure of an angle that is supplementary to $\angle 4$ if $\angle 4 \cong \angle 9$ and $m\angle 9 = 24$.

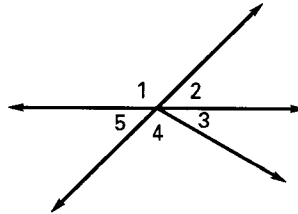


Practice A

For use with pages 44–50

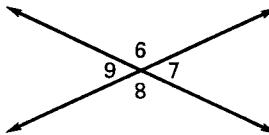
Use the figure at the right.

1. Are $\angle 1$ and $\angle 2$ adjacent?
2. Are $\angle 1$ and $\angle 2$ a linear pair?
3. Are $\angle 3$ and $\angle 4$ a linear pair?
4. Are $\angle 2$ and $\angle 5$ vertical angles?
5. Are $\angle 1$ and $\angle 4$ vertical angles?
6. Are $\angle 3$ and $\angle 5$ vertical angles?



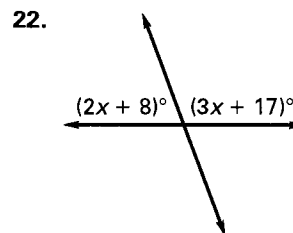
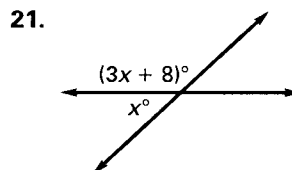
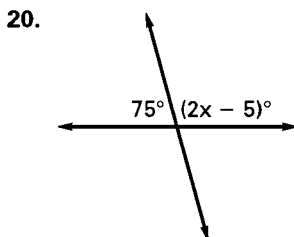
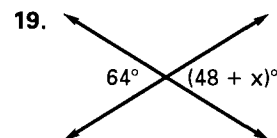
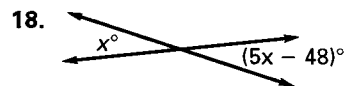
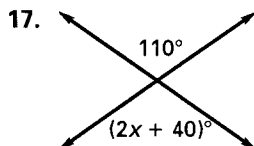
Use the figure at the right.

7. If $m\angle 6 = 78^\circ$, then $m\angle 7 = \underline{\quad ? \quad}$.
8. If $m\angle 8 = 94^\circ$, then $m\angle 6 = \underline{\quad ? \quad}$.
9. If $m\angle 9 = 124^\circ$, then $m\angle 8 = \underline{\quad ? \quad}$.
10. If $m\angle 7 = 47^\circ$, then $m\angle 9 = \underline{\quad ? \quad}$.
11. If $m\angle 8 = 158^\circ$, then $m\angle 9 = \underline{\quad ? \quad}$.
12. If $m\angle 7 = 15^\circ$, then $m\angle 6 = \underline{\quad ? \quad}$.

In Exercises 13–16, assume $\angle A$ and $\angle B$ are complementary and $\angle B$ and $\angle C$ are supplementary.

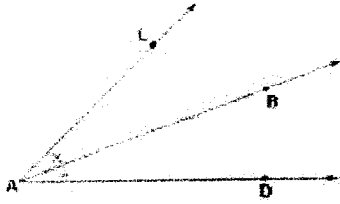
13. If $m\angle A = 42^\circ$, then $m\angle B = \underline{\quad ? \quad}$ and $m\angle C = \underline{\quad ? \quad}$.
14. If $m\angle B = 78^\circ$, then $m\angle A = \underline{\quad ? \quad}$ and $m\angle C = \underline{\quad ? \quad}$.
15. If $m\angle A = 17^\circ$, then $m\angle B = \underline{\quad ? \quad}$ and $m\angle C = \underline{\quad ? \quad}$.
16. If $m\angle B = 45^\circ$, then $m\angle A = \underline{\quad ? \quad}$ and $m\angle C = \underline{\quad ? \quad}$.

Find the value of the variable.



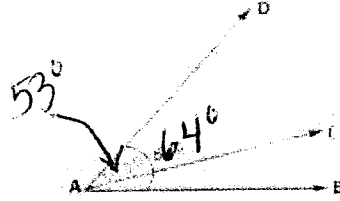
Algebraic Problems in Geometry

1. Angle Bisector



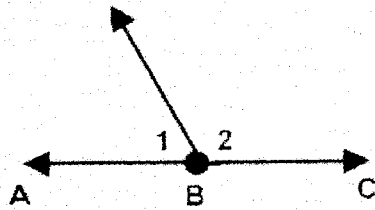
$$m\angle CAB = m\angle BAD$$

2. Angle Addition Postulate



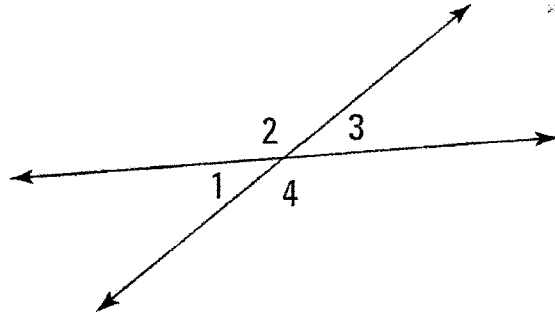
$$m\angle DAC + m\angle CAB = m\angle DAB$$

3. Linear Pair



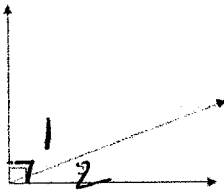
$$m\angle 1 + m\angle 2 = 180^\circ$$

4. Vertical Angles



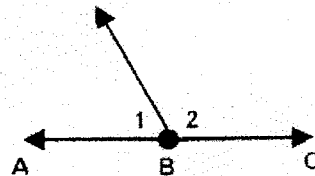
$$m\angle 2 = m\angle 4$$

5. Complementary Angles



$$m\angle 1 + m\angle 2 = 90^\circ$$

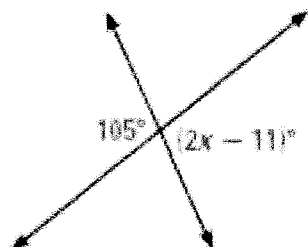
6. Supplementary Angles



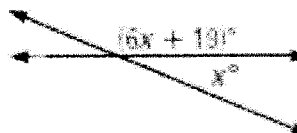
$$m\angle 1 + m\angle 2 = 180^\circ$$

Ⓜ USING ALGEBRA Find the value(s) of the variable(s).

28.



29.



FINDING ANGLES $\angle A$ and $\angle B$ are complementary. Find $m\angle A$ and $m\angle B$.

45. $m\angle A = 5x + 8$

46. $m\angle A = 3x - 7$

$m\angle B = x + 4$

$m\angle B = 11x - 1$

FINDING ANGLES $\angle A$ and $\angle B$ are supplementary. Find $m\angle A$ and $m\angle B$.

49. $m\angle A = 3x$

50. $m\angle A = 6x - 1$

$m\angle B = x + 8$

$m\angle B = 5x - 17$

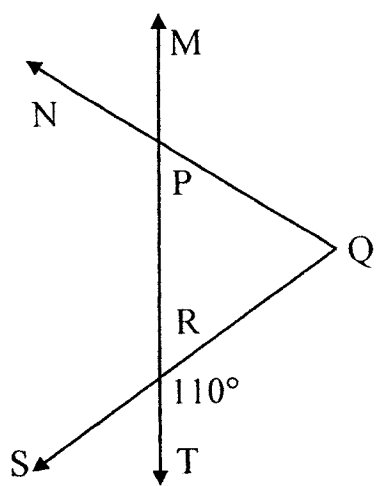
36C

Name: _____

Period _____

Vertical Angles and Angle Bisectors Worksheet

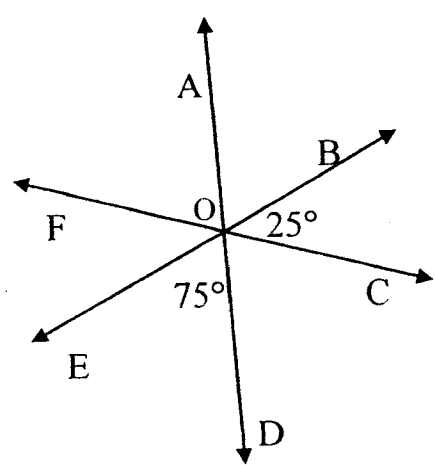
Given: $\angle QRT = 110^\circ$. Find the measures of each angle.



1. $\angle QRP =$ _____
2. $\angle PRS =$ _____
3. $\angle NPQ =$ _____
4. $\angle SRT =$ _____

5. $\angle MPN$ is vertical to \angle _____

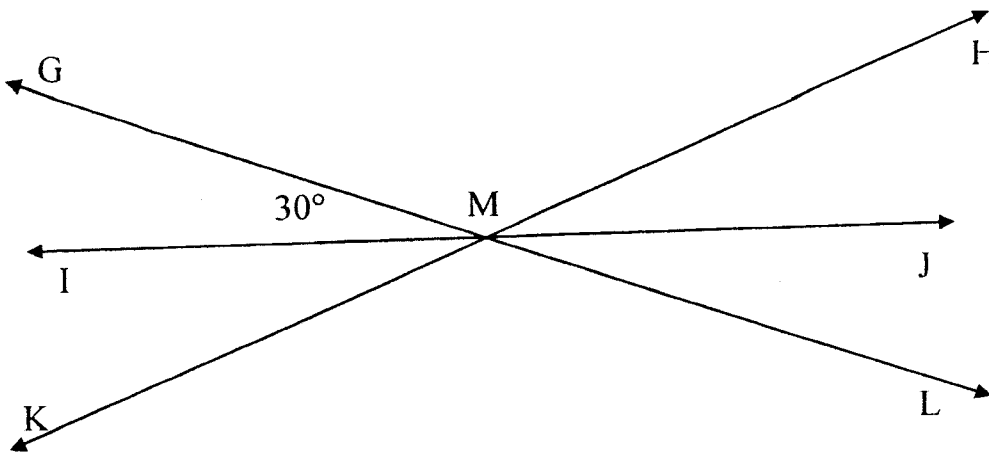
Given: $\angle EOD = 75^\circ$ and $\angle COB = 25^\circ$. Find the measure of each angle.



6. $\angle COD =$ _____
7. $\angle FOE =$ _____
8. $\angle BOA =$ _____
9. $\angle BOD =$ _____
10. $\angle EOA =$ _____
11. $\angle FOA =$ _____
12. $\angle EOC =$ _____
13. $\angle DOA =$ _____
14. $\angle FOC =$ _____
15. $\angle FOB =$ _____

36d

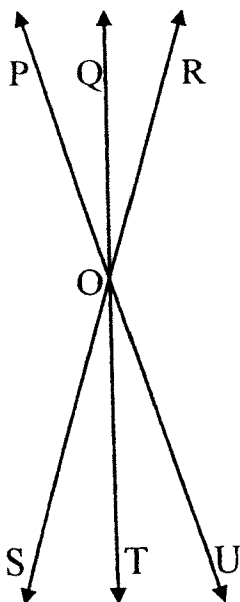
Given: Line IJ bisects $\angle GML$. Find the measure of each angle.



16. $\angle GML =$ _____ 18. $\angle JML =$ _____ 20. $\angle HML =$ _____

17. $\angle IMK =$ _____ 19. $\angle HMJ =$ _____ 21. $\angle GMH =$ _____

Given: Line QT bisects $\angle ROP$. $\angle ROP = 50^\circ$. Find the measure of each angle.



22. $\angle POQ =$ _____

23. $\angle QOR =$ _____

24. $\angle SOU =$ _____

25. $\angle ROU =$ _____